DETAILED ACTION

1. This Office action for U.S. Patent Application 10/743,722 is responsive to communications filed 13 July 2009, in reply to the Non-Final Rejection of 11 March 2009. Currently, Claims 1–8, 10–24, and 29–53 are pending. Of those, Claims 34–53 are new.

2. In the previous Office action, Claims 1–8, 10–24, 29, and 31–33 were rejected under 35 U.S.C. 101 as non-statutory. Claims 1, 5, 10–13, 18–22, 29, and 33 were rejected under 35 U.S.C. 103(a) as obvious over "Temporally Adaptive Motion Interpolation Exploiting Temporal Masking in Visual Perception" (Lee et al.), in view of U.S. Patent Application Publication 2003/0142748 A1 (Tourapis et al.). Claims 3, 4, 13, and 23 were rejected under 35 U.S.C. 103(a) as obvious over Lee et al. in view of Tourapis et al. and in view of U.S. Patent Application Publication 2002/0146071 A1 (Liu et al.). Claims 15 and 24 were rejected under 35 U.S.C. 103(a) as obvious over Lee et al. in view of Tourapis et al. and in view of "MPEG Video Compression Standard" (Mitchell). Claim 16 was rejected under 35 U.S.C. 103(a) as obvious over Lee et al. in view of Tourapis et al. and in view of "Digitale Bildcodierung" (Ohm). Claim 31 was rejected under 35 U.S.C. 103(a) as obvious over Lee et al. in view of Tourapis et al. and in view of "Video Indexing Using MPEG Motion compensation Vectors" (Ardizzone et al.). Claim 32 was rejected under 35 U.S.C. 103(a) as obvious over Lee et al. in view of Tourapis et al. and in view of U.S. Patent Application Publication 2002/0012452 A1 (van Overveld et al.).

Information Disclosure Statement

3. The information disclosure statement filed 13 July 2009 fails to comply with 37 CFR 1.98(a)(1), which requires the following: (1) a list of all patents, publications, applications, or other information submitted for consideration by the Office; (2) U.S. patents and U.S. patent application publications listed in a section separately from citations of other documents; (3) the application number of the application in which the information disclosure statement is being submitted on each page of the list; (4) a column that provides a blank space next to each document to be considered, for the examiner's initials; and (5) a heading that clearly indicates that the list is an information disclosure statement. The information disclosure statement has been placed in the application file, but the information referred to therein has not been considered. Applicant has only submitted an IDS cover sheet, not any actual list of references for consideration.

Response to Arguments

4. Applicant's arguments filed with respect to the claims under 35 U.S.C. 101 have been fully considered but they are not persuasive. Although the claims are considered to be inherently tied to a machine or any machine, they are not considered to be tied to any "particular" machine, as is currently required for patentability under Section 101. Since the 101 rejections are maintained under a new interpretation of *In re Bilski*, this Office action is non-final.

5. Applicant's arguments filed with respect to claim 1 have been fully considered but they are not persuasive. Applicant states that neither of the two cited *Lee* or *Tourapis* references disclose the claimed limitation of "comparing the motion speed of a first picture in the plurality [of pictures following a reference picture] to the motion speeds of each of the other pictures [in the plurality]". *Remarks/Arguments*, pp. 16–18, "Claims 1–8, 10–24, 29, and 31–33 define over the prior art". Specifically, Applicant first contends that in *Lee*, the cumulative SSP metric based on five distance measures from a reference picture does not disclose the claimed comparison of the speed in the first picture in the plurality of non-reference frames. Each of the five measures of *Lee* discloses a "temporal segmentation" metric that detects scene segmentation points (SSPs) in a video sequence. *Lee*, pg. 515: column 1. When an SSP is found, *Lee* encodes every frame between the reference frame and the frame right before the SSP as a B frame. *Id.* at 515:1–2. The SSP may be found from one frame that produces a wide divergence or "distance" from previous frames, or over a more gradual accumulation of divergence or "distance" over several frames. Each of the five measures is used to determine the distance or dissimilarity between frame f(n) and frame f(m). *Id.* at 518:1–519:1. The motion compensation error metric was used in the discussion of *Lee* as it relates to claim 1 since it is the only distance metric that computes and uses the motion vectors of each frame following the reference frame. The *Lee* reference was cited for the limitations of "computing motion vectors" and "determining a motion speed". *Office action*, page 7. The Office action also cited *Lee*

as disclosing the claimed principle of encoding or assigning a group of consistent pictures as B pictures. *Office action* at 7–8. The *Lee* reference was not cited for the limitation of comparing the motion speed of the first picture following a reference picture to the motion speeds of each of the other pictures following the reference picture, or specifically using consistent "motion speed" within these pictures as the consistency metric.

More specifically, in the 3 December Interview, applicant stated that none of the accumulative metrics of *Lee* cannot be combined with the constant motion metric of *Tourapis*, since in *Lee*, some sequences, for example, a camera pan, a sequence showing rotational motion, or a sequence in which a camera follows parallel to an object moving over a background, exhibit constant speed appropriate for continued direct mode in *Tourapis*, but eventually produce an accumulated change that forces a new scene cut in *Lee*. *Lee*, page 515: column 1.

The *Tourapis* reference was used to disclose the claimed limitation of comparing the motion speed of the first non-reference picture with the following non-reference pictures. *Office action*, pages 8–9. Applicant states that *Tourapis* does not actually calculate this speed, but merely assumes that speed is constant. *Remarks*, pages 17–18. However, in *Tourapis*, this assumption is made only when it has already been decided to encode a frame with the direct mode. *Tourapis*, paragraphs 0066, 0068. However, not all B frames in *Tourapis* are encoded with a single direct mode motion vector. Figure 7 illustrates an example. *Tourapis* at paragraph 0069. In this case, there is an acceleration of an object from time t-2 through time t-1 to current time t. *Id.*

Then, for the frame 704 at time t, a single direct mode motion vector cannot be used. *Id.* at figure 7. Instead, two previous motion vectors from frame 700 at time t-2 and frame 702 at time t-1 are scaled to produce the motion vector at time t. *Id.* As applicable to the present invention, let frames 700, 702, and 704 be examples of a plurality of frames following a reference frame, with frame 700 as the first frame, as claimed. Here, the motion speed is not constant, but accelerating. *Id.* at paragraph 0069. Then, frames 702 and 704 cannot re-use the motion vectors from frame 700 as direct mode frames. Frame 702 needs to have its own motion vectors calculated, and frame 704 needs to have its motion vectors scaled from both frames 700 and 702. *Id.* at figure 7. This is an inconsistent motion speed, as determined by comparing the motion speeds of frames 702 and 704 with the motion speed of frame 700. Inter frames in *Tourapis* need not be always coded as direct mode frames at all. Instead, a cost-benefit analysis is performed to determine if the savings on bit rate with direct mode outweigh the distortions introduced. *Id.* at paragraph 0078. Direct mode coding only is used when it provides a "good enough estimate" so that conventional motion estimation is not needed. *Id.* at paragraph 0093. Considering this, at least the consideration of acceleration within a set of frames that are candidates for direct mode to determine if a single set of motion vectors should be used in paragraphs 0078 and figure 7 of *Tourapis* encompasses the claimed comparison of motion speed of the frames within the plurality of pictures, and this comparison is implicitly disclosed elsewhere in *Tourapis* as part of the process to determine whether to encode a set of frames as direct mode frames.

It is respectfully submitted that Applicant's analysis of *Lee* is faulty. In *Lee*, when motion is constant, motion compensation error is ideally **small**. For example, suppose a pixel starts at the point (0,0) and is moving at constant speed at two pixels horizontally and 1 pixel vertically per frame. In *Lee*, the pixel is expected to be at position (2,1) at time 1, position (4, 2) at time 2, &c. This would be encoded as a direct mode motion vector of (2,1) according to *Tourapis*. If *Lee* expects this pixel at position (4, 2) at time 2, the motion compensation error for this pixel, defined as the distance between the actual position of the frame and the predicted position from the motion compensation error, is zero. Over all the pixels of the frame, if the total error in position is below some threshold at time 2, the frame at time 2 is encoded as an inter frame, specifically as a direct-mode B frame by *Tourapis*. Recall the statements in *Tourapis* that direct mode coding is used only if the direct mode does not introduce a large distortion or does not provide a bad estimate. Now consider that between time 2 and time 3, the object containing the pixel accelerates or distorts, and so the pixel at time 3 is at position (8, 5) instead of (6, 3) as would be expected. If the motion encoder still attempts to locate the pixel at position (6, 3), the distance measure for this pixel is $\left|\sqrt{(8-6)^2+(5-3)^2}\right| = \left|\sqrt{4+4}\right| = 2\sqrt{2}$, assuming a Euclidean distance metric. If the accelerating object is large enough, than the distance metric of *Lee* would be sufficient to force a new I frame at this point. However, at the same time, the accuracy of the direct mode prediction in *Tourapis* would also diminish enough so that the direct mode would no longer be used. This effect also may accumulate. If the initial motion vector for a constant motion direct mode prediction in *Tourapis* is slightly inaccurate,

eventually, the frames predicted from this inaccurate motion vector would be grossly divergent from their predictions, causing the distance measure of *Lee* to be large–and the distortion in *Tourapis*. In fact, the motion compensation error in *Lee* may very well be foreseeable as the predefined condition described in paragraph 0093 of *Tourapis* to determine if the direct mode prediction is "good enough" to continue.

Thus, the rejection of claim 1 under 35 U.S.C. 103 is maintained.

Applicant additionally states that dependent claim 32 is allowable on its own merits. Applicant states that the use of the *van Overveld* reference for claim 32 was inapplicable, since it does not disclose determining the MAD in a "picture" context. In the previous Office action, the examiner cited *van Overveld* as illustrating that an MAD was known at the time of the present invention. *Office action*, pg. 17. Paragraph 0051 of *van Overveld* describes SAD as a "matching error for a depth d", and paragraph 0052 states that the error is taken over pixels in a block B, and the difference is a change of a "candidate value". However, it is respectfully submitted that paragraphs 0047 and 0048 describe the blocks described in paragraph 0052 of *van Overveld* as part of an "image", and the "depth" being compared a pixel value such as luminance. However, *van Overveld* also describes the matching algorithms for "depth" being used for "motion" also, for example in the abstract and in paragraph 0066. Therefore, it is respectfully submitted that *van Overveld* is suitable for determining motion error within a picture, as claimed.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 34–53 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 34–53 are each directed to a "computer-readable medium encoded with a set of instructions which, when performed by a computer, perform a method". There is no support in the specification, original claims, or drawings for the claimed computer-readable medium. Figure 1 instead illustrates a video coder comprising discrete components.

Claim Rejections - 35 USC § 101

8. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

9. Claims 1–8, 10–17, and 29–33 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims 1–8, 10–17, and 29–33 are each directed to a "method", which is one of the four statutory categories of patentable subject matter. A claim to a method must be tied to a particular machine or apparatus or must transform a particular article to a different state or thing. *In re Bilski*,

545 F.3d 943, 954–960 (Fed. Cir. 2008). In the particular case, the method steps are described as computing motion vectors for pictures as part of a "video sequence". As stated in the previous Office action, this is sufficient to tie the claimed methods to a machine. However, this is insufficient to tie the claimed methods to a "particular" machine, as required by *Bilski*. Instead, the claim can cover a method performed on any possible machine capable of sufficient processing power, from a specialized ASIC or VLSI chip, to a general-purpose processor on a personal computer or server, to a programmable DSP. Then, the claim fails the "machine" test. The claim also fails the "transform" test. "Pictures" or "video" *per se* are considered pure immaterial, intangible information, not physical, tangible "articles". Then, all method claims are not directed to patent-eligible methods.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 1, 5, 10-13, 18-22, 29, 33, 34, 38, 42–45, 50, and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over “Temporally Adaptive Motion Interpolation Exploiting Temporal Masking in Visual Perception” (Lee et al.), in view of US Patent Application Publication 2003/0142748 A1 (Tourapis et al.). Lee et al. teaches a method for dynamically determining a Group of Picture (GOP) structure in a video based on

temporal segmentation. **Regarding claim 1**, in one embodiment of Lee et al., temporal segmentation is determined from a motion compensation error determination based on a difference between an actual position of the pixels with a predicted position of the pixels, as determined from motion estimation (pg. 519: column 1). Since the motion estimation is calculated from a motion vector search (pg. 516: column 2), the motion compensation error is determined "based on the computed motion vectors" from the picture. Then, Lee et al. discloses "computing motion vectors for a plurality of pictures".

Consider the determination of temporal segmentation based on motion compensation error in Lee et al. If the error between an actual frame and a predicted frame becomes too great, then it is determined that there is little consistency between frames, but if there is a small error, then temporally adjacent frames are considered to exhibit consistency. This information is used in a detector that finds a scene segmentation point, which is a point at which small changes in a single scene have accumulated past a certain threshold away from a reference frame. The frame immediately preceding the scene segmentation point becomes a P frame, and the frames in between the last reference frame and the scene segmentation point are encoded as B frames (pg. 515: columns 1-2). Then, Lee et al. teaches assigning pictures as B pictures based on a consistency measure. However, as discussed in the interview of November 15, determining motion compensation error *per se* is not considered the same as determining consistent motion speed.

Tourapis et al. teaches a video coder that encodes inter macroblocks using various modes. In one mode, a "Direct prediction mode", a current macroblock in a B

picture may be calculated from previously-decoded motion information (paragraph 0067), if motion speed is constant (paragraph 0066). Then, the motion for the current picture is just re-used from the previous picture, instead of being re-coded and re-transmitted. When motion speed is determined to be constant, the motion for the current macroblock is directly taken from the corresponding macroblock in a reference frame (paragraph 0068), and the motion speed, that is, the magnitude of the motion vectors across the picture, are scaled from the reference frames (paragraph 0067). This determination is known as Motion Projection. Then, in Tourapis et al., a constant motion speed is known as a measure of consistency between pictures. As shown in figure 4, a plurality of pictures 404 and 406 may be encoded as direct-mode B frames between reference pictures 402 and 408, and picture 404 is the claimed "first picture in the plurality of pictures" closest to reference picture 402 exhibiting the same consistent scaled motion speed.

Lee et al. discloses the claimed invention except for determining a picture mode from a calculation of consistent motion speed. Tourapis et al. teaches that it was known to determine motion compensation mode as a result of a motion projection calculation of constant motion. Therefore, it would have been obvious to one having ordinary skill in the art to determine a picture mode based on the validity of an assumption of constant motion, as taught by Tourapis et al., since Tourapis et al. states in paragraph 0118 that such a modification would enable a direct mode coding of blocks in B pictures, further exploiting temporal redundancy with a current picture and reference pictures.

Regarding claim 5, the method of Lee et al. could be adjusted to insert 1-3 default P frames in a GOP to avoid encoding delay (pg. 516, column 2 – pg. 517, column 1). For a 16-frame GOP, if 1 P-frame is inserted, for example, no more than 8 B-frames could be inserted consecutively. Even if no P-frames are inserted by default in a GOP, the number of consecutive B-frames is limited by the GOP size of 15 or 16 frames, since a GOP starts with an I-frame.

Regarding claims 10-13 and 33, in Lee et al., two kinds of segmentation are determined, corresponding with the claimed "termination condition". The first type of termination is the determination of a P picture, reached when an accumulated error in pictures goes past a certain threshold. This corresponds with a failure in the motion projection of Tourapis et al., in which case it is determined that a Direct Mode coding is inappropriate. When the threshold is reached, the frame immediately preceding the segmentation point becomes a P frame, and the frames in between the last reference frame and the scene segmentation point are encoded as B frames (pg. 515: columns 1-2). Another segmentation detector determines an abrupt scene change, and encodes an I frame at the start of a new scene and a P frame at the end of the previous scene (pg. 515, column 1).

Regarding claim 18, figure 1 of Lee et al. shows a Temporally Adaptive Motion Interpolation (TAMI) encoder. This encoder includes a buffer, a conventional MPEG encoder, a motion estimation unit, a scene segmentation point (SSP) detector, and a GOP Structure unit (pg. 514, column 2 – pg. 515, column 1). If this GOP Structure Unit performs the Motion Projection calculation of Tourapis et al., it corresponds with the

claimed “colinearity detector”. **Regarding claim 19**, the TAMI unit determines the positions of P and B pictures in a GOP (page 514, column 2). **Regarding claim 20**, as mentioned previously, motion projection may be determined from the colinearity of motion vectors. **Regarding claim 21**, the Abrupt Scene Change (ASC) detector determines a scene change in an encoded video. **Regarding claim 22**, as mentioned above, at a scene change, an old scene ends with a P-frame and a new scene starts with an I-frame.

Regarding claim 29, in Tourapis et al., figure 6 illustrates a direct mode P picture at time t+2, in which the motion vector (dx, dy) for the corresponding block A at time t+1 is extended for current block B. This corresponds with the claimed iterative method.

Claims 34, 38, 42–45, 50, and 53 are co-extensive in scope with Claims 1, 5, 10–13, 29, and 33, respectively, but are directed to a method encoded in a computer-readable medium. At least the *Tourapis* reference is also described as embodied in a "program" that resides on a storage medium. *Tourapis*, paragraphs 0051–0052.

12. Claims 2, 6-8, 17, 35, 39–41, and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. in view of Tourapis et al., as applied to claims 1 and 10 above, in view of “Scene-Context Dependent Reference Frame Placement for MPEG Video Coding” (Lan et al.), cited in the Information Disclosure Statement filed 12 May 2004. **Claim 2** of the present application recites encoding the first frame with a variance in motion speed as a P-frame. However, in Lee et al., the first frame with a motion

inconsistency above a certain threshold is encoded as an I-frame, and the frame immediately previous to this point is encoded as a P-frame (pg. 515, column 2).

Lan et al. teaches a picture-type assignment algorithm in which if the difference in accumulated motion between a current frame and a reference frame is above a certain value, the current frame is encoded as a P-frame, and becomes the next reference frame (pg. 481, column 2).

Lee et al., in combination with Tourapis et al., discloses the claimed invention except for encoding the first frame that does not follow a frame trend as a P-frame. Lan et al. teaches that it was known to encode a significantly changed frame as a P-frame. Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to encode reference frames as P-frames rather than I-frames as taught by Lan et al., since it was well-known in the art that P-frames require less bits to be encoded than I-frames.

Additionally, claims 6 and 17 recite coding some pictures as I pictures for a random-access policy. Lee et al. and Tourapis et al. do not teach this limitation. Lan et al. teaches an MPEG coding method in which frame type assignment is varied. **Regarding claims 6 and 17**, Lan et al. discloses forcing I frames into a coded video sequence every 15 frames to facilitate random access (pg. 486, column 1). **Regarding claim 7**, in Lan et al., whenever an I-frame is encoded, the previous frame is encoded as a P-frame (pg. 481, column 1). **Regarding claim 8**, in Lee et al., P frames can be encoded as P1 frames which are regular MPEG P frames, or as P2 frames, which have

the same bit allocation as MPEG B frames and are thus coarsely quantized (pg. 514, column 2).

Claims 35, 39–41, and 49 are co-extensive in scope with claims 2, 6–8, and 17**,** but are directed to a method encoded in a computer-readable medium. At least the *Tourapis* reference is also described as embodied in a "program" that resides on a storage medium. *Tourapis*, paragraphs 0051–0052.

Lee et al., in combination with Tourapis et al., discloses the claimed invention except for forcing I-frame encoding. Lan et al. teaches that it was known to encode I-frames at regular intervals. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the coding method of Lee et al. to insert periodic I frames as taught by Lan et al., since Lan et al. states in page 486, column 1 that such a modification would enable random search and pause features at playback time.

13. Claims 3, 4, 14, 23, 36, 37, and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. in view of Tourapis et al. as applied to claims 1, 12, and 21, in view of US Patent Application Publication 2002/0146071 A1 (Liu et al). Lee et al. teaches scene change detection, but always encodes the first picture after the scene change as an I-frame and the last picture before the scene change as a P-frame.

Liu et al. teaches a scene change detection component in a video encoder. In Liu et al., a scene change is normally encoded as an I-frame. However, this is not always the most efficient coding method. **Regarding claims 3, 14, and 23,** Figure 10

shows a scene change between frame 1001 and frame 1002. Frame 1001 was originally scheduled to be encoded as an I-frame, but since a scene change immediately follows, much computational effort would be wasted in calculating high-quality images immediately after the scene change. Then, frame 1001 is instead encoded as a P-frame, and frames 1002 and 1048 are encoded as low-quality predictive frames, since human vision is insensitive to quality changes near a scene change (paragraph [0079]), corresponding with the claimed coding of a picture before a scene change at full quality or low quality in **claim 4**. Figure 11 gives a further example. Here, a scene change occurs immediately preceding a P-frame 1102. Frame 1104, two frames before the scene change, was originally scheduled as an I-frame, but instead the I-frame is delayed until frame 1110, for which motion vectors have not yet been calculated (paragraph [0080]). Finally, figure 13 shows a scene change immediately preceding P-frame 1302, which was originally scheduled as an I-frame. However, since motion vectors 1304 and 1306 to frame 1302 have already been calculated, the I-frame is delayed until frame 1308, originally scheduled to be the next P-frame (paragraph [0082]).

Claims 36, 37, and 46 are co-extensive in scope with claims 3, 4, and 14, but are directed to a method encoded in a computer-readable medium. At least the *Tourapis* reference is also described as embodied in a "program" that resides on a storage medium. *Tourapis*, paragraphs 0051–0052.

Lee et al., in combination with Tourapis et al., teaches the claimed invention except for encoding P-frames immediately surrounding scene changes. Liu et al.

teaches that it was known to encode a frame immediately preceding or immediately following a scene change as a P-frame. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to encode frames adjacent to scene changes as P-frames as taught by Liu et al., since Liu et al. states in paragraph [0079] that such a modification would increase encoding efficiency by not encoding irrelevant data near a scene change, at which time the human eye cannot clearly distinguish details of an image.

14. Claims 15, 24, and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al., in view of Tourapis et al., as applied to claims 10 and 21 above, and in further view of “MPEG Video Compression Standard” (Mitchell), cited in the Information Disclosure Statement of 17 July 2006. Although in Lee et al., a default picture is encoded as a B-frame, Lee et al. does not explicitly state that pictures adjacent to scene changes are B-frames. However, Mitchell states that since the eye is insensitive to image content near scene changes, image quality can be sacrificed. **Regarding claims 15 and 24,** one method of reducing image quality is to start a new scene with B pictures (footnote 13). **Claim 47** is co-extensive in scope with claim 15, but is directed to a method encoded in a computer-readable medium. At least the *Tourapis* reference is also described as embodied in a "program" that resides on a storage medium. *Tourapis*, paragraphs 0051–0052.

Lee et al., in combination with Tourapis et al., discloses the claimed invention except for encoding B-frames adjacent to a scene change. Mitchell teaches that it was

known to encode B-frames immediately following a scene change. Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to force B-frames immediately following a scene change, as taught by Mitchell, since Mitchell states in page 79 that such a modification would reduce the bit rate needed to encode a scene change.

15. Claims 16 and 48 rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. in view of Tourapis et al. as applied to claim 12 above, and in further view of "Digitale Bildcodierung" (Ohm), cited in the Information Disclosure Statement of 17 July 2006. Lee et al. teaches scene change detection based on a low correlation between two images (pg. 515, column 1), but does not disclose the exact method used. Ohm teaches the Normalized Cross-Correlation Function (NCCF), shown as equation 5.52. **Regarding claim 16,** NCCF is used in many pattern-matching applications, such as motion estimation (pg. 1). Two images, $x_a(m_a, n_a)$, and $y_j(m_a, n_a)$, are compared over pixels (m_a, n_a) in area Λ. This corresponds with images $x_n(i, j)$ and $x_{n+1}(i, j)$ in area (M, N) in the present invention. Two pictures have the highest match when the NCCF is at a maximum (pg. 3), and correspondingly, two pictures have a low match, indicative of a scene change, when the value of NCCF is low. **Claim 48** is co-extensive in scope with claim 16, but is directed to a method encoded in a computer-readable medium. At least the *Tourapis* reference is also described as embodied in a "program" that resides on a storage medium. *Tourapis*, paragraphs 0051–0052.

Lee et al., in combination with Tourapis et al., discloses the claimed invention except for the exact method used to determine correlation of two images. Ohm teaches that it was known to determine how closely two images match each other with Normalized Cross-Correlation. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to determine the correlation of two images using NCCF, as taught by Ohm, since Ohm states in page 4 that such a modification would allow for a more accurate comparison of the similarity of two images rather than by difference levels alone.

16. Claims 31 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. in view of Tourapis et al., as applied to claim 29 above, and in further view of "Video Indexing Using MPEG Motion Compensation Vectors" (Ardizzone et al.) Conventionally, a motion vector for a block is defined as the displacement of the block between two pictures, velocity is defined as displacement over time, and speed is defined as the magnitude of velocity. However, while two-dimensional displacement is normally given with the Euclidian distance metric, the square root of the sum of the squares of the x and y components, in claim 31, displacement is given with the Manhattan distance metric, the sum of the x and y components. Ardizzone et al. teaches a method for spatially segmenting an MPEG image with motion vectors (pg. 725, columns 1-2). In one step of Ardizzone et al., magnitudes of the motion vectors are built into a histogram to determine "dominant" regions of the image (pg. 727, column 2). If a motion vector has a large magnitude, this means that its macroblock is

displaced a large distance, and so has a high speed. An experiment was performed to determine how best to retrieve related images to a given image, by matching motion vector characteristics (pg. 728, column 2 – pg. 729, column 1). **Regarding claim 31,** using a Manhattan distance metric yielded the best result (pg. 729, column 1). **Claim 51** is co-extensive in scope with claim 31, but is directed to a method encoded in a computer-readable medium. At least the *Tourapis* reference is also described as embodied in a "program" that resides on a storage medium. *Tourapis*, paragraphs 0051–0052.

Lee et al. discloses the claimed invention except for defining pixel block displacement with a Manhattan distance metric. Ardizzone et al. teaches that it was known to calculate motion vector magnitude with Manhattan distance. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to determine motion speed of an image based on the Manhattan distance metric, as taught by Ardizzone et al., since Ardizzone et al. states in page 729, column 1, that such a modification would produce the greatest accuracy in characterizing the motion vectors of the image.

17. Claims 32 and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. in view of Tourapis et al. as applied to claim 29 above, and further in view of U.S. Patent Application Publication 2002/0012452 A1 (van Overveld et al.). Claims 32 and 52 are directed to calculating the MAD value of blocks over a frame to

determine motion speed consistency. In contrast, Lee et al. teaches calculating an SAD value.

Van Overveld et al. teaches a motion compensation system. **Regarding claim 32**, van Overveld et al. lists several common algorithms to determine a motion estimation error between a motion-compensated macroblock and an actual macroblock within an image. These algorithms include the Mean Square Error (paragraph 0049), the SAD (paragraph 0051), the MAD (paragraph 0053), and the Sum of Square Errors (paragraph 0053). **Claim 52** is co-extensive in scope with claim 32, but is directed to a method encoded in a computer-readable medium. At least the *Tourapis* reference is also described as embodied in a "program" that resides on a storage medium. *Tourapis*, paragraphs 0051–0052.

Lee et al., in combination with Tourapis et al., discloses the claimed invention except for calculating an MAD as a motion vector error. Van Overveld et al. teaches that it was known to use a MAD instead of an SAD to determine motion estimation accuracy. Therefore, it would have been an obvious matter of design choice to determine motion error with the MAD rather than the SAD, since applicant has not disclosed in the specification, particularly paragraph [50], that the exact method of error calculation solves any stated problem or is for any particular purpose, and it appears that the invention would perform equally well with either error metric.

Conclusion

18. This Office action is non-final due to the new grounds of rejection under 35 U.S.C. 101.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Werner whose telephone number is (571)272-9662. The examiner can normally be reached on Monday-Friday from 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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